

Appl. No.: 10/524,388
Amendment Dated December 22, 2009
Reply to Office Action of June 22, 2009

REMARKS/ARGUMENTS

Applicants submit this Amendment under 37 CFR § 1.111 in response to the non-final Office Action dated June 22, 2009. Entry of this Amendment is believed proper on the basis that all pending claims are placed in condition for allowance. In an effort to expedite prosecution, the scope of independent Claim 1 has been amended to clarify the scope of the present application. In particular, Claim 1 now recites that the movable element of the electrical machine “is adapted to carry out a linear reciprocating motion.” In addition, dependent Claim 25 has been canceled, and the status identifier for Claim 27 has been corrected to read “Currently amended.” Applicant respectfully submits that the rejection of these claims is traversed in light of the amendments described above for the reasons given below.

Independent Claim 1 and dependent Claims 2, 8-21, and 23-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over PCT Document No. WO 01/78219 to Sadarangani, et al. (“*Sadarangani*”) in view of U.S. Pat. App. Pub. No. 2002/0180295 to Kaneda, et al. (“*Kaneda*”) and U.S. Pat. No. 3,334,254 to Kober (“*Kober*”). Dependent Claims 3, 4, 6, and 7 were rejected under § 103(a) as being unpatentable over *Sadarangani* in view of *Kaneda* and *Kober*, in further view of U.S. Pat. No. 4,308,479 to Richter (“*Richter*”). Dependent Claim 5 was rejected under § 103(a) as being unpatentable over *Sadarangani*, *Kaneda*, *Kober* and *Richter*, in further view of U.S. Pat. No. 6,211,593 to Nashiki (“*Nashiki*”).

With respect to independent Claim 1, page 4 of the Office Action contends that a person of ordinary skill in the art would find it obvious to apply the techniques of both *Kaneda* and *Kober* in the invention of *Sadarangani* to reduce magnetic flux leakage between adjacent permanent magnets and to avoid fringing with respect to the stator. The Office Action further contends that applying the techniques of *Kaneda* and *Kober* in the invention of *Sadarangani* would achieve the invention claimed in Claim 1. However, Applicants respectfully disagree both with the contention that it is obvious to modify *Sadarangani* with the teachings of *Kaneda* and *Kober*, as well as with the contention that such a modification could achieve the present invention.

First, a person of ordinary skill in the art of designing electrical machines would not find it obvious to modify the linear reciprocating machine of *Sadarangani* to include the secondary magnets of the rotary machines of *Kaneda* and *Kober*. Furthermore, because of the perceived disadvantage to the performance of the linear reciprocating machine, a person of ordinary skill would consider modifying the linear machine of *Sadarangani* to include secondary magnets a step backwards. The addition of mass to a linear reciprocating machine is known to increase vibrations and mechanical frictional losses and is therefore disfavored by those skilled in the art. In contrast to a linear machine, a rotating machine is capable of tolerating much more mass, provided that rotational symmetry is maintained. The addition of secondary magnets also reduces the active magnetic surface area of the reciprocating member, which also contributes to inefficiency in a linear machine. In addition, including additional secondary magnets in a reciprocating member of a linear machine results in a greater number of components to assemble, which increases manufacturing costs.

As discussed previously in response to the Office Action of March 17, 2009, the fact that the present invention achieves a net performance advantage despite the additional mass of the secondary magnets does not discount the reasoning against including secondary magnets described above, since the advantageous result was not predictable at the time of the invention. See MPEP 2143.02(II) (stating that a conclusion of nonobviousness can be supported by evidence showing there was no reasonable expectation of success at the time the invention was made). See *In re Rinehart*, 531 F.2d 1048 (CCPA 1976) and *Ex parte Erlich*, 3 USPQ2d 1011 (Bd. Pat. App. & Inter. 1986). With respect to the present invention, a person of ordinary skill in the art would not have had any reasonable expectation of success in adding secondary magnets to a linear reciprocating machine at the time of the invention. Therefore, the fact that the present invention, despite the lack of any reasonable expectation of success at the time of the invention, was able to achieve a net performance advantage by adding secondary magnets to its linear reciprocating machine, supports a conclusion of nonobviousness under MPEP 2143.02(II).

In addition, the disclosure in *Sadarangani* itself expressly teaches away from adding secondary magnets to the disclosed linear machine. In fact, *Sadarangani* expressly states that its

particular alternating winding arrangement permits mutually alternating primary magnets to be brought closer together, in order to provide “a high effect density with regard to the weight as well as the volume of the electrical machine.” *Sadarangani*, page 4, lines 15-20. The close proximity of primary magnets results in a more rapid change of coupled flux as the reciprocating member moves, rendering the electromagnetic induction more efficient. *Id.*

MPEP 2141.02(VI) requires consideration of prior art references in their entirety, *i.e.*, as a whole, including portions that would lead away from the claimed invention. Accordingly, particular consideration must be given to this disclosure in *Sadarangani*. See *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983). *Sadarangani* indicates to a person of ordinary skill in the art that its particular winding arrangement, which lacks secondary magnets, is key to obtaining high efficiency and compact implementation of the electrical machine. Accordingly, not only is there a lack of motivation in the prior art to include the secondary magnets of *Kaneda* and *Kober* in the linear machine of *Sadarangani*, but such a combination is prohibited by *Sadarangani* itself.

Furthermore, even if a motivation to add the secondary magnets disclosed in *Kaneda* and *Kober* in the linear machine of *Sadarangani* did exist, the combination would still not achieve the invention recited in Claim 1. When ascertaining the differences between Claim 1 and the prior art, the question under 35 U.S.C. 103 is not whether the differences *themselves* would have been obvious, but whether the claimed invention *as a whole* would have been obvious. See MPEP § 2141.02 (citing *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530 (Fed. Cir. 1983) (emphasis added)).

Sadarangani in view of *Kaneda* and *Kober* fails to teach “magnetic fields of adjacent permanent-magnet members and their secondary magnets [that] are operable to mutually repel for essentially avoiding flux fringing in respect of the stator” as recited by Claim 1 (emphasis added). Unlike the invention of Claim 1, the configuration disclosed in *Kaneda* does not effectuate flux squeezing and, accordingly, does not avoid flux fringing. *Kaneda* discloses a rotating machine with a peripheral arrangement of primary magnets having gradually changing magnetic field directions for reducing cogging torque. *Kaneda* does not disclose secondary

magnets that are associated with concentrating primary magnetic flux. Rather, *Kaneda* teaches achieving greater efficiency and smaller size by employing the conventional method of implementing small air gaps between the rotor and the stator to reduce fringing. The configuration of magnets creating a non-radial distribution of magnetic fields taught by *Kaneda*, on the other hand, is not intended to reduce flux fringing but rather is intended to reduce cogging torque.

Likewise, the secondary magnets of *Kober* are not intended to have any flux fringing effect. In fact, flux fringing is not discussed anywhere in *Kober*. ~~have any magnetic field concentrating effect. Applicants respectfully submit that *Kober* does not disclose anything relevant to the present invention aside from employing a gradually changing rotor magnetic field direction for reducing cogging effects in developed torque.~~ Therefore, neither *Kaneda* nor *Kober* teach secondary magnets that are operable to mutually repel and that avoid flux fringing as required by Claim 1. Furthermore, due to the fundamental differences between rotating electrical machines and reciprocating machines with electro-magnetic power transfer, the secondary magnets of *Kaneda* and *Kober* cannot simply be transferred to the linear machine of *Sadarangani* to achieve the invention disclosed in Claim 1.

Applicants have made significant contributions to the art which are not taught or suggested by the cited prior art, either alone or in combination. In contrast to *Kaneda* and *Kober*, the configuration recited in Claim 1 of the present invention has the effect of squeezing the fringe magnetic fields of the primary magnets into a transverse direction relative to a direction of reciprocation. By directing the fringe magnetic fields of the primary magnets toward the magnetic flux conductors of the stator, the configuration of Claim 1 eliminates fringing magnetic flux, and ultimately improves the efficiency of the reciprocating machine. Inasmuch as at least the above-discussed feature of Claim 1 is clearly not taught or suggested by the cited references, Applicants respectfully submit that Claim 1 as amended is patentably defined over the art of record.

Since the patentability of Claim 1 has been argued as set forth above, Applicants will not take this opportunity to argue the merits of the rejection with regard to dependent Claims 2, 8-21,

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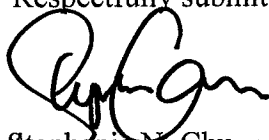
and 23-24, and 26-29. However, Applicants do not concede that the dependent claims are not independently patentable and reserve the right to argue the patentability of the dependent claims at a later date if necessary.

CONCLUSION

In view of the remarks presented above, Applicants respectfully submit that all now pending claims are allowable and such favorable action is respectfully requested. Should the Examiner have any questions, comments or proposed claim amendments, he is encouraged to contact the undersigned so that allowance of this application can be expedited.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



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